H. STONE & G. W. SCOTT.

MOTOR.

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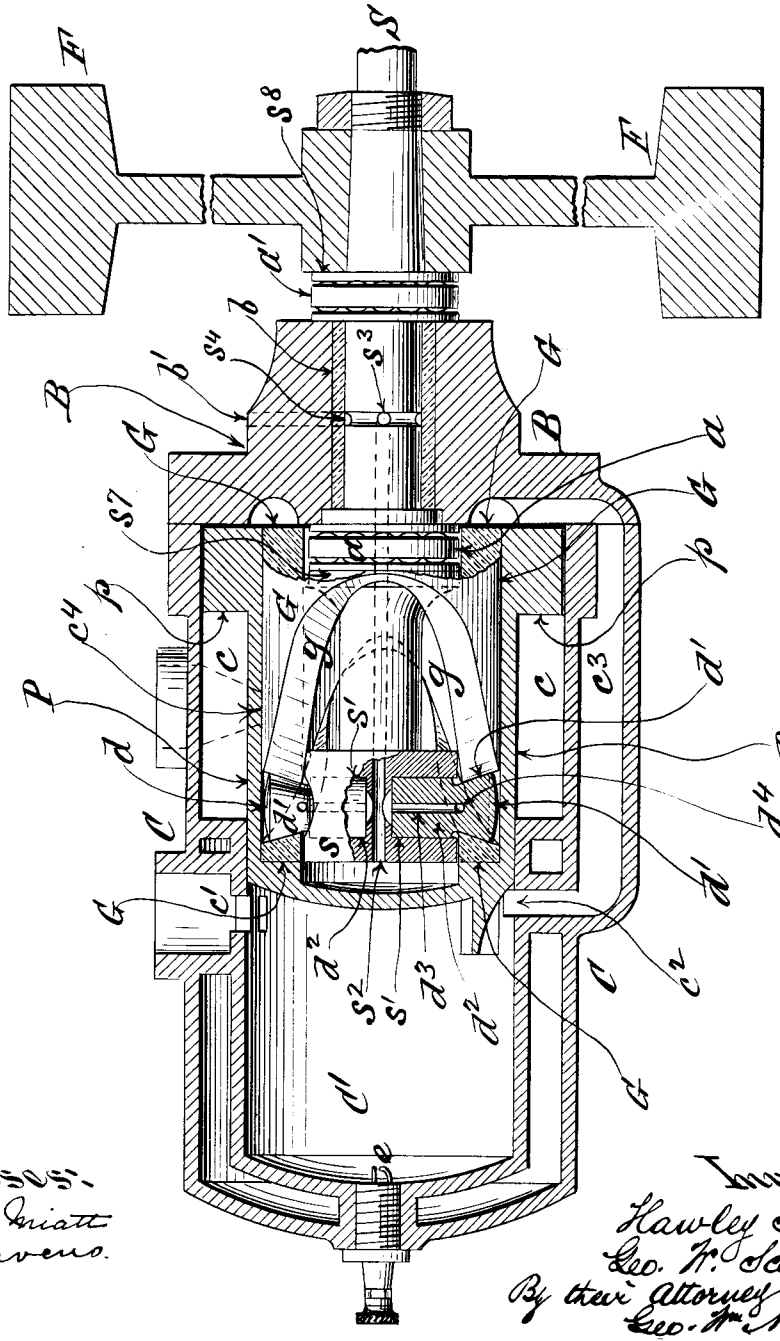
1,052,763. Patented Feb. 11, 1913.



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UNITED STATES PATENT OFFICE.

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MOTOR.

1,052,763. Specification of Letters Patent. Patented Feb. 11, 1913.

Application filed May 24, 1912. Serial No. 699,428.

To all whom it may concern:

Be it known that we, HAWLEY STONE, a citizen of the United States, and a resident of Rosebank, in the county of Richmond and State of New York, and GEORGE W. SCOTT, a citizen of the United States, and a resident of the borough of Brooklyn, city, county, and State of New York, have invented certain new and useful Improvements in Motors, of which the following is a specification.

Our invention relates to the class of motors in which the reciprocatory motion of a piston is converted directly into rotary motion without the intervention of crank connections &c.; and our object is to afford a simple, practical, light, but compact and substantial, evenly balanced anti-friction motor of relatively high power and efficiency, adapted to the requirements of actual use.

The invention consists in the specific construction and arrangement of parts hereinafter described and claimed, a distinguishing feature being a piston formed with a continuous internal cam groove having a plurality of reciprocal race ways engaging with radial driving rollers on a central power shaft, whereby the latter is rotated by the reciprocation of the piston as hereinafter more fully set forth.

In the construction shown in the accompanying drawings by way of illustrating the practical application of our invention, we show in sectional elevation the essential parts of a hydro-carbon or internal combustion engine, it being understood that we do not confine ourselves exclusively to that class of motor, since the new principle of construction involved is applicable to steam and other motors in which the expansive force is applied to a reciprocatory piston.

P, represents the outer casing or shell of a trunk piston closed at one extremity and open to the cylinder C, at the other. Protruding into the piston P, through its open end is one extremity of the power shaft S, mounted in a bearing *b*, formed for it in the head B, of the cylinder C. This inner end of the power shaft S, is formed with a head *s*, carrying radially arranged driving rollers *d*, *d*, which engage with a continuous cam groove *g*, formed in the interior of the piston, preferably though not necessarily, in or by means of a lining G, of the shell P, as illustrated in the drawing, in which case the lining is divided by the groove *g*, into two sections, the opposed edges of which form the side walls of the groove.

In the arrangement of parts shown herein the cam groove *g*, is duplex in that duplicate reciprocatory race-ways or advance and retraction thrusts are formed, one in each half of the cylinder, and the shaft head *s*, is provided with two diametrically disposed driving rollers *d*, *d*, engaging therewith. We thus attain a perfect balance of piston and of driving shaft, although it is obvious that the number of reciprocatory cam groove race-ways and rollers may be increased with like result, provided they are spaced equi-distant; and hence we do not limit ourselves to the diametrical disposition of parts shown but claim any plural duplication of symmetrically arranged reciprocatory cam race-ways and driving rollers. The perfect balance and distribution of strain thus attained reduces frictional resistance to the minimum and adds materially to the efficiency of the engine. Thus by means of the duplication of power rollers and cam race-ways shown in the drawing we attain the equivalent of a two cylinder engine in a single cylinder; and by increasing the number of equidistant reciprocatory cam race-ways and shaft rollers this result may be still further augmented, each reciprocatory cam race-way representing the equivalent of a cylinder.

In order that the driving rollers *d*, *d*, may run perfectly true and without peripheral slip or frictional loss, we make the traveling surfaces of the heads *d*, *d*, thereof convergent with relation to the axial center of the shaft S, and also make the side walls of the groove *g*, of like inclination, so that the outer edge of each roller travels at the same peripheral speed as the inner portion thereof. Hence the motion imparted to the shaft is smooth and uniform.

The conical heads *d'*, *d'*, of the rollers *d*, *d*, are formed with cylindrical shanks d^2, d^2,

fitting in radial sockets s', s', formed for their reception in the shaft head s; and they are lubricated through the medium of an axial oil duct s^2, in the shaft S, which duct communicates with the roller sockets s', s', and with a transverse duct s^3, opening into an annular groove s^4, in the portion of the shaft within the bearing b, said annular groove s^4, being fed with a suitable lubricant through the duct b', in the head B, in any suitable or well known manner. The cylindrical shanks d^2, d^2, of the driving rollers d, d, are also formed with axial ducts d^3, d^3, opening into transverse distributing ducts d^4, d^4, in the conical roller heads d', d', so that the lubricant is freely distributed to all the contacting surfaces.

The shaft S, is held against longitudinal movement by anti-friction thrust bearings a, a', preferably interposed between the main bearing b, in the head B, and annular shoulders s^7, s^8, on the shaft S,—the latter shoulder s^8, being represented in the present case by the hub of the fly wheel F.

The piston P, is held in alinement and prevented from turning on its axis by tongues p, p, which protrude into longitudinal grooves or recesses c, c, in the cylinder casing C, the length of said alinement recesses c, c, being sufficient to accommodate the tongues p, p, for the full reciprocal thrust of the cam groove g.

The combustion end or chamber C', of the cylinder is provided with an electric sparker e, or equivalent ignition device; and is formed with the discharge port c', and inlet port c^2, which latter communicates through the passage c^3, with the rear of the cylinder into which hydro-carbon from the carbureter is introduced, as in a two cycle, three port engine, when the supply port c^4, is uncovered by the piston P,—the latter acting as its own port valve in a manner well known in the art,—and the explosion of the charge in the combustion chamber C', driving the piston P, in one direction, and the momentum of the fly wheel F, returning it in the other direction to receive the force of the next succeeding explosion, and so on continuously during the operation of the engine, it being understood that the continuous internal cam groove g, in the piston, acting through the driving rollers d, d, converts the power thrust stroke of the piston into the rotary motion of the shaft, and vice versa, during the retractile or feed thrust stroke of the piston. It is also to be noted in this connection that vibration is practically eliminated, and that the power is greatly increased, as there are at least two explosions and power strokes of the piston to every revolution of the shaft, and as many more as may be provided for as hereinbefore set forth.

From the foregoing it will be seen that the device is simple in its nature, the moving parts are few and the structure as a whole is compact.

What we claim as our invention and desire to secure by Letters Patent is,

1. A motor of the character designated, comprising a power cylinder and connections, a piston in said cylinder formed with an internal continuous driving cam groove having a plurality of equi-distant reciprocatory race-ways extending in the same direction lengthwise of the piston, a rotatable shaft protruding into said piston and provided with a plurality of equi-distant driving rollers engaging with the said reciprocatory race-ways in the interior of the piston, and coöperating recesses and tongues on the cylinder and piston for guiding said piston and preventing it turning during its reciprocation, and a fly wheel on said shaft, for the purpose set forth.

2. A motor of the character designated comprising a power cylinder and connections, a piston in said cylinder formed with an internal continuous driving cam groove having duplicate reciprocatory race-ways extending in the same direction lengthwise of the piston, one in each half of the piston, a rotatable shaft protruding into said piston and provided with diametrically disposed driving rollers engaging said reciprocatory race-ways in the interior of the piston, and coöperating recesses and tongues on the cylinder and piston for guiding the piston and preventing its turning during its reciprocation, and a fly wheel on said shaft, for the purpose described.

3. A motor of the character designated, comprising a power cylinder and connections, a piston in said cylinder formed with an internal continuous driving cam groove having a plurality of equi-distant reciprocatory race-ways extending in the same direction lengthwise of the piston, the side walls of which converge toward the axial center of the piston, a rotatable shaft protruding into said piston and provided with a plurality of equi-distant driving rollers formed with conical heads contacting with the convergent side walls of the said driving cam groove in the interior of the piston, and cooperating recesses and tongues on the cylinder and piston for guiding the piston and preventing its turning during its reciprocation, and a fly wheel on said shaft, for the purpose described.

4. A motor of the character designated comprising a power cylinder and connections, a front piston closed at one end and open to the cylinder at the other, a power shaft protruding through the open end of the piston, radially arranged driving rollers carried by the end of the shaft within the piston, the interior wall of said piston being

formed with a continuous cam groove, said rollers being spaced equidistant and the cam groove having duplicate reciprocatory raceways extending in the same direction of the length of the piston whereby the power thrust stroke of the piston is converted into rotary motion of the shaft and vice versa during the feed thrust stroke of the piston and coöperating recesses and tongues on the cylinder and piston for guiding the piston and preventing its turning during its reciprocation.

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